

Joint Advanced Missile Instrumentation (JAMI) System Flight Termination Safe and Arm



Presented
By
Bruce Hornberger



NAWC/WD China Lake

Code 478300D

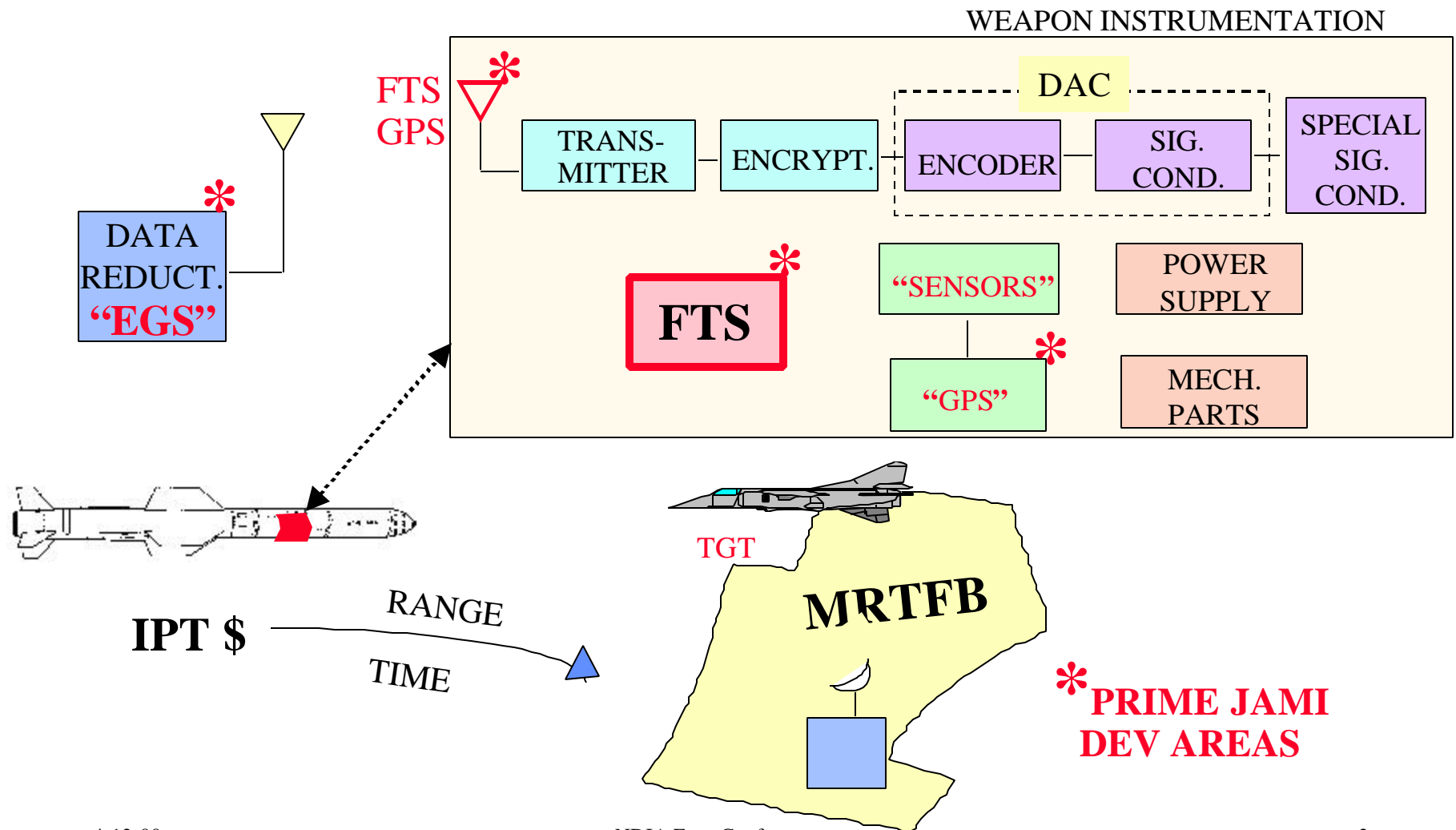
760-939-7674

hornbergerba@navair.navy.mil

Approved for public release; distribution is unlimited.



JAMI System





JAMI System

- JAMI Will Exploit GPS Technology to Allow World-wide Test & Training--Eliminating, in Most Cases, the Need for Range-specific (or Multi-system) Facilities.
- **END GAME SCORING CAPABILITIES**
 - ± 2 Feet Vector Position Accuracy
 - Velocity Measurement to 10,000 Ft/sec
 - 50 G Acceleration w/o Loosing GPS Track
 - Attitude Accuracy < 0.5 Degree
 - Timing Correlation $< 100 \mu s$



FTSA Targeted Applications

- Bomb (e.g. JDAM)
- Glide (e.g. JSOW)
- Missile (e.g. STD MSL, HARM)
- Arm on Rail (e.g. STD MSL Targets)



JAMI TEAM

- Program Mgr: Mr. Don Scofield, NAWCWD, China Lake, CA
- Tri-Service component points of contact:
 - Army: Mr. Robert Epps, RTTC, Redstone Arsenal, AL
 - Navy: Mr. Dave Powell, NAWCWD, Pt Mugu, CA
 - Air Force: Mrs. Carolyn Coleman, 46TW/TSWI, Eglin AFB, FL
 - Range Safety: Mr. Jerry Mathre, NAWCWD, China Lake, CA
 - BMDO: Ms. Debbie Giordano, BMDO, Wash DC



FTSA VS S&A

- FTSA
 - Overriding Concern is to Not Allow the Weapon to Go Outside the Range Footprint
 - Failsafe: FTSA Initiates Termination
 - Defining Specification is RCC 319-99
- S&A
 - Overriding Concern is to Not Allow Unintended Initiations
 - Failsafe: S&A Duds
 - Defining Specification is Mil-Std-1316

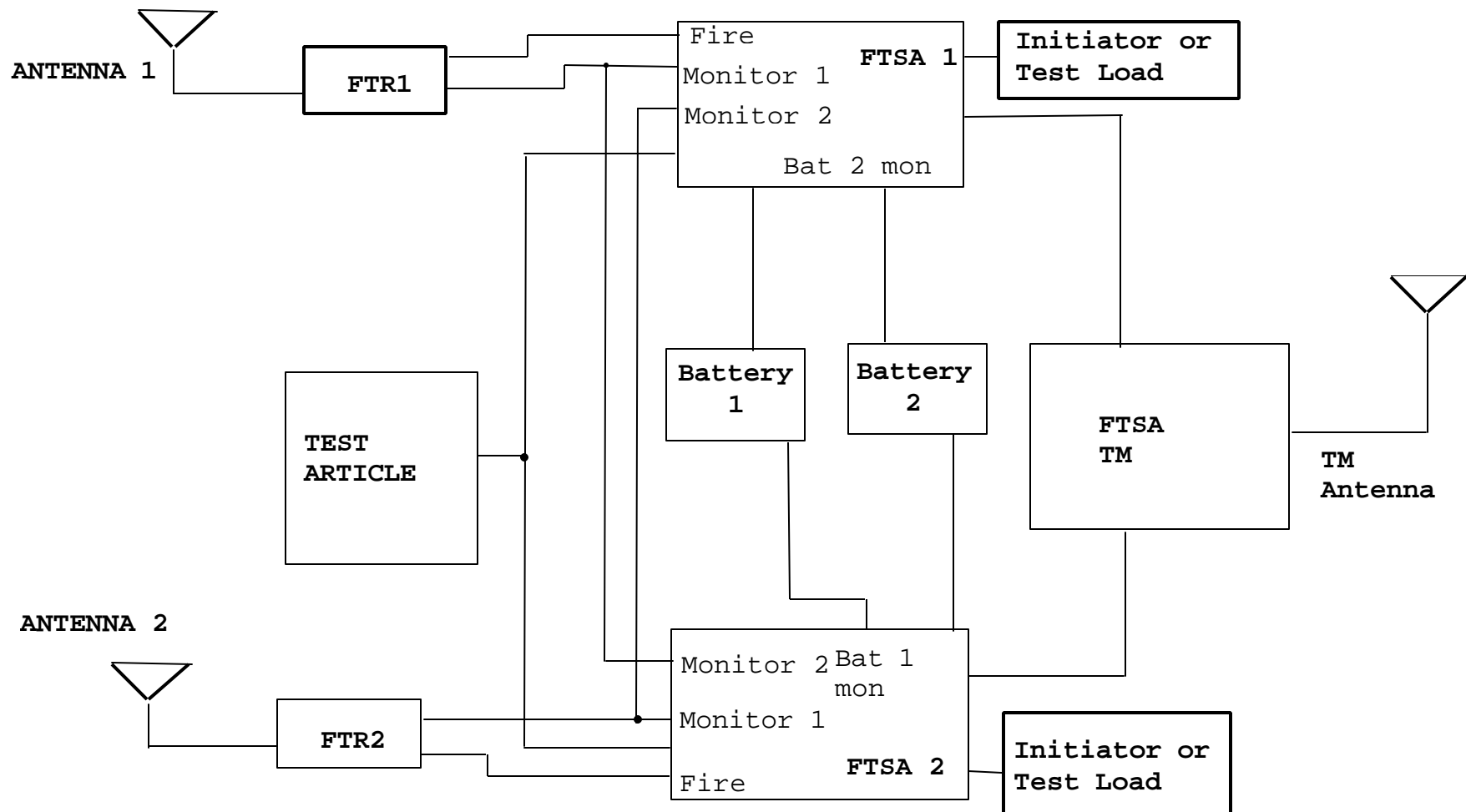


CONFLICTING OBJECTIVES

- FTSA & S/A Have Conflicting Objectives and Requirements
 - The JAMI FTSA Incorporates Features that Conflict with Traditional S/A Design Methodology
 - MIL-STD-1316 Is Not Invoked on the JAMI FTSA
 - Fail Safe Features Differ
 - Safety Environments Programmable



JAMI FTSA





JAMI FTSA

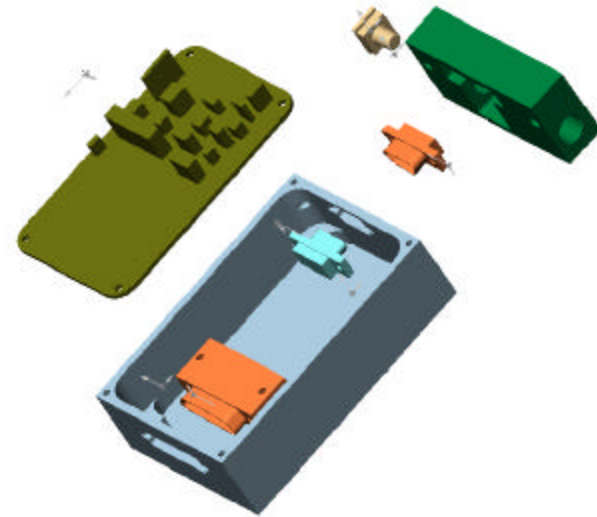
Tactical Connector

Programming Connector

Circuit Board

Transfer line output

Removable
Explosive
Transfer Block



• Features:

- Programmable Performance
- Low Cost
- Small size (8 cubic inches)



JAMI FTSA Requirements

- Compliant With RCC 319-99
- Programmable (at test facility) For Multiple Applications
- Small Size ($< 8 \text{ in}^3/\text{unit}$)
- Low Cost ($< \$2200/\text{unit}$)
- Qualified To “Worst Case” Environmental Levels
 - Based on Environments of Potential Users
- Removable Explosives (EFI, Etc.)
- Fully Testable (Including HV Output)



PROGRAMMABLE INPUTS

- Failsafe Enable (Fire)
 - Loss of Monitor (tone)
 - Loss of Power
- First Motion Enable
 - First motion Valid Time
- Acceleration Enable
 - Axis of Acceleration
 - Acceleration Level
- Umbilical Disconnect
- Safe Separation Time



NON PROGRAMMABLE INPUTS

- Terminate Command
- Simulated Accelerometer Input
- Battery Power
- Arm Enable

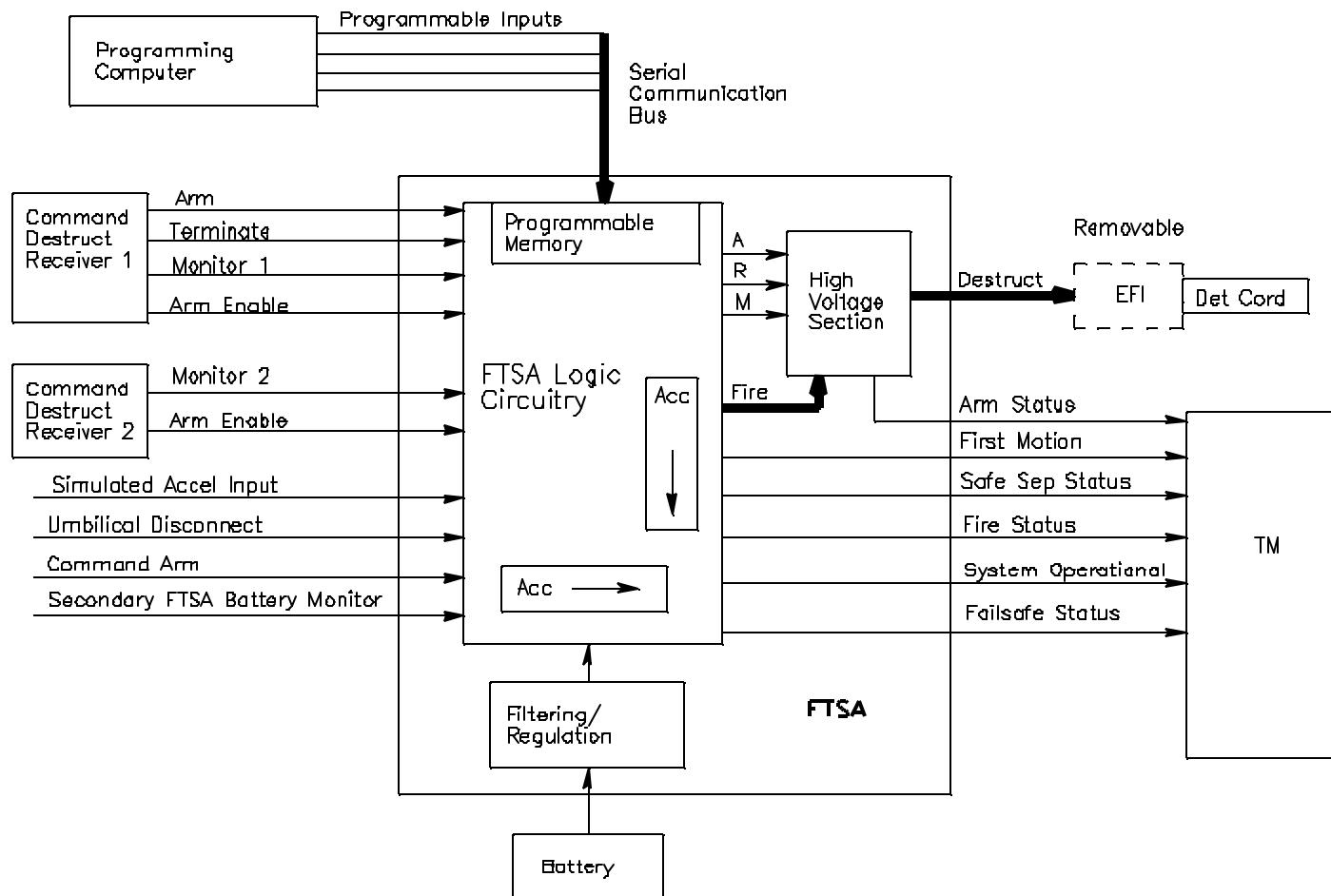


OUTPUTS

- Flight Destruct (Explosive)
- Safe/Arm Status
- Fire Status
- Safe Separation Status
- First Motion Status
- System Operational
- Failsafe Status



FTSA INTERFACE





JAMI FTSA FIRESET

- Novel Trigger Design (Patent in Process)
- Small In Size
- Low In Cost (<\$20)
- High Reliability
 - 3200 shots @ 1500A
- No Unique Parts
 - All COTS



TEST ENVIRONMENTS

- Range Safety Document RCC 319-99
 - May be First FTSA Fully Qualified to New Document
- Database of Environmental Profiles of Numerous Weapons Systems



DEVELOPMENT UNDER CRADA

- Cooperative Research and Development Agreement
 - Raymond Engineering Operations (REO)
 - Signed 12 April 1999
- Division of Responsibilities
 - China Lake (POC Andy Yuenger 760-939-7768)
 - Electrical/Explosive Design and Development
 - Environmental Testing
 - REO (POC Dale Spencer 860-632-4477)
 - Packaging
 - Hardware Manufacturing



STATUS

- Spec Nearing Completion
- Electrical Design Nearing Completion
 - Breadboards Being Debugged
- Electrical Volume Study Complete
- Fireset Studies Complete
- Qual Plan in Process
- Expect Qualification Completion Nov 2002



JAMI FTSA BENEFITS

- Low Unit Cost
- Small Volume
- No need for Application Specific Redesign
- Minimal Application Specific Implementation Costs
- Ranges Could Retain a Stockpile Reducing Schedule Impacts